

TABLE 2-2

Key Activities to Install Groundwater Monitoring Wells

Remedial Investigation

San Gabriel Valley Area 3 Superfund Site

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Activity Category	Activities
Groundwater Monitoring Well Borehole Drilling	Drilled 12-inch-diameter conventional and multiport monitoring wells using direct (mud) rotary drilling techniques. The drilling mud support the geologic formation surrounding the borehole to prevent collapse during drilling and geophysical logging activities, and carried the drill cuttings from the borehole. Logs of drill cuttings record borehole lithology, described according to the Unified Soil Classification System , at 10-foot intervals or at significant observed changes in lithology.
Borehole Geophysical Logging	<p>Geophysical logging supports interpretation and correlation of lithologic units and stratigraphic units. Use of geophysical logs support design of groundwater monitoring wells. Geophysical logging include conventional electric, guard, gamma ray, sonic, and caliper logging techniques.</p> <ul style="list-style-type: none"> • Electric logs measure the flow of electrical current in the borehole and adjacent geologic formation and use 16- and 64-inch normal resistivity, guard resistivity, and spontaneous potential. Electric logs combined with other logs provide a qualitative interpretation of lithology and lithologic contacts. Low resistivity indicate fine-grained intervals compared to coarse-grained intervals, which exhibit relatively high resistivity. • Guard resistivity logs, used as a backup to conventional electric logs, measure the flow of electric current in the formation. Guard resistivity logs focus the electric current enabling deeper penetration into the formation surrounding the borehole to provide higher resolution of lithology and bed thickness. Conditions within the borehole influence guard logs less than conventional electric logs, which results in more representative measurements of formation resistivity. • Gamma ray logs provide a record of the total gamma radiation detected in a borehole. The radioactive elements uranium and thorium, which emit gamma radiation, tend to be concentrated in clay, as opposed to sands or gravels, and help to identify fine-grained units. • Sonic logging evaluates porosity in liquid filled pores. Sonic logging improves the ability to identify the depth of the water table in mud rotary boreholes. • Caliper logs record the diameter of the borehole and help to identify zones, if any, where the borehole walls has expanded the borehole diameter, thus necessitating extra construction materials to install the well.
Groundwater Monitoring Well Design	<p>Subsurface lithologic data and geophysical logs help to determine the depths for placement of screens in each borehole. Review of records of existing wells nearby, including geophysical logs, environmental data, and well construction details, such as screened interval depth also assist in determining the depth of the screened interval.</p> <p>Primary considerations in determining depths for the screened intervals in groundwater monitoring wells include the following:</p> <ul style="list-style-type: none"> • High permeability and porosity – Target zones include sand or gravel intervals interpreted as primary pathways for contaminant migration. • Thickness of the permeable units – Greater than 10 feet thick. • Thickness of potential confining units – Confining units interpreted as thick enough to provide a potential confining boundary to the permeable unit, at least on a local scale. <p>Four conventional groundwater monitoring wells (EPAMW11, EPAMW12A, EPAMW17, and EPAMW18) were installed and equipped with a dedicated QED® Model #ST1102M 1.66-inch-diameter, variable speed bladder pump within the screened interval that enables repeated groundwater sampling.</p> <p>Four multiport groundwater monitoring wells (EPAMW13, EPAMW14, EPAMW15, and EPAMW16) were installed and equipped with a Westbay MP 38 System®, constructed of 1.5-inch-inside-diameter plastic and polyvinyl chloride casing materials. Sampling ports installed in each screened interval allow for characterizing and monitoring the alluvial aquifer over a thickness of several hundred feet at a single location. Three permanently inflated water-filled packers installed between each screened interval prevent upward and downward groundwater flow in the well casing. The packers provide a means for quantitatively documenting an absence of groundwater flow in the well casing between screened intervals.</p>

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Well Development and Waste Disposal	<p>Well development uses a combination of physical techniques, including bailing, swabbing, airlifting, and pumping, to remove sediments and other materials disturbed or introduced during drilling. Well development generally involve the use of air lifting and pumping as preferred techniques. Measurement of parameters (i.e., turbidity, pH, electrical conductivity, and temperature) help to monitor the progress of well development. Turbidity measurements between 5 to 20 nephelometric turbidity units indicated completion of well development.</p> <p>Development of wells completed in low permeability formations, including EPAMW17 and EPAMW18, require bailing and swabbing. This alternative method consists of submerging the screened interval by adding potable water to the casing; swabbing the entire screened interval; and then bailing the well dry, ensuring the volume of water removed equals or exceeds the volume of water introduced. This process was repeated to remove the residual drilling mud, and until the turbidity was below 100 nephelometric turbidity units. Downhole well video surveys conducted in multiport wells prior to ending well development verify that the screens are free of fine sediment and drilling mud.</p> <p>Waste haulers disposed of well drilling and well development wastes offsite following analytical testing that characterized waste constituents and ensured proper waste disposal.</p>
Surveying	<p>Surveying of the groundwater monitoring well locations establishes coordinates in units of Universal Transverse Mercator meters, North American Datum, 1983, Zone 11, and also establishes wellhead reference point elevations to the nearest 0.01 foot referenced to the National Geodetic Vertical Datum, 1929. Calculated groundwater elevations represent the measured depth to groundwater relative to the wellhead reference point of known elevation. EPA's San Gabriel Basin database contains the survey data.</p>
Reduction to Scope in Planned Fieldwork	<p>During the course of the RI, slight alterations occurred to the planned approach for collecting data and conducting field activities based on circumstances encountered in the field. The following list summarizes noteworthy modifications to the RI activities:</p> <ul style="list-style-type: none"> • Spinner logging and depth-specific groundwater sampling at four inactive production wells proposed in the Data Evaluation Report (EPA, 2001a) was not conducted. EPA instead relies on other suitable investigation data. • Findings at monitoring well EPAMW11 precluded installation of a groundwater monitoring well screened in the alluvium because only the underlying bedrock contained groundwater. EPA installed one conventional groundwater monitoring well screened in the bedrock at this location instead of the planned two-well cluster. • Although monitoring well EPAMW12B was designed to observe conditions near the water table, groundwater never accumulated in the well and the well remains dry; therefore, groundwater samples have not been collected.